

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS
PATENT OF THE UNITED STATES IS:

1. A semiconductor laser device comprising:

a semiconductor laser element;

a temperature measuring element configured to measure a temperature;

a temperature regulating unit having said semiconductor laser element and said
temperature measuring element thermally connected thereto;

a current detecting unit configured to detect a driving current applied to said
semiconductor laser element; and

a control unit configured to control said temperature regulating unit using a control
function to achieve a substantially constant wavelength output from said semiconductor laser
element, said control function defining a relationship between a predetermined driving
current and a predetermined temperature, said control unit being configured to control said
temperature regulating unit such that the temperature detected by said temperature measuring
element substantially equals the predetermined temperature corresponding to the detected
driving current as defined by said control function.

2. The semiconductor laser device according to Claim 1, wherein said control unit is
configured to control said temperature regulating unit to extract heat from said semiconductor
laser element as the detected driving current increases in accordance with said control
function.

3. The semiconductor laser device according to Claim 2, wherein said
semiconductor laser element incorporates a diffraction grating, and oscillates plural
longitudinal modes.

4. The semiconductor laser device according to Claim 1, wherein said

semiconductor laser element incorporates a diffraction grating, and oscillates plural longitudinal modes.

5. The semiconductor laser device according to Claim 1, wherein:

said semiconductor laser element includes an active layer; and

said control function is defined such that a temperature of said active layer remains substantially constant for varying driving currents.

6. The semiconductor laser device according to Claim 1, wherein said control unit includes a storage unit configured to store said control function.

7. The semiconductor laser device according to Claim 1, wherein:

said control unit further comprises a setting unit which sets a desired wavelength, and a storage unit configured to store plural control functions;

said control unit is configured to select a new control function from said plural control functions that corresponds to a desired wavelength entered into said setting unit; and

said control unit is configured to control said temperature regulating unit according to said new control function.

8. The semiconductor laser device according to Claim 1, wherein said control function is common to semiconductor laser devices having similar structure and operation.

9. The semiconductor laser device according to Claim 1, wherein said control function is defined by plural temperatures detected by said temperature measuring element and corresponding driving currents detected by said current detecting unit where a substantially constant wavelength output from said semiconductor laser element is maintained.

10. The semiconductor laser device according to Claim 1, wherein said control function is a linear function of predetermined temperature versus predetermined driving

current.

11. The semiconductor laser device according to Claim 1, wherein said control function is a quadratic function of predetermined temperature versus predetermined driving current.

12. The semiconductor laser device according to Claim 1, wherein said temperature regulating unit is a Peltier device and said temperature measuring device is a thermistor.

13. A semiconductor laser device comprising:
a semiconductor laser element;
a temperature measuring element configured to measure a temperature;
a temperature regulating unit having said semiconductor element and said temperature measuring element thermally connected thereto;
a means for detecting a driving current applied to said semiconductor laser element;
and
a means for controlling said temperature regulating unit using a control function to achieve a substantially constant wavelength output from said semiconductor laser element.

14. The semiconductor laser device according to Claim 13, wherein:
said control function defines a relationship between a predetermined driving current and a predetermined temperature; and

said means for controlling controls said temperature regulating unit such that the temperature detected by said temperature measuring element substantially equals the predetermined temperature corresponding to the detected driving current as defined by said control function.

15. The semiconductor laser device according to Claim 1, wherein said means for controlling controls said temperature regulating unit to extract heat from said semiconductor

laser element as the detected driving current increases in accordance with said control function.

16. The semiconductor laser device according to Claim 15, wherein said semiconductor laser element incorporates a diffraction grating, and oscillates plural longitudinal modes.

17. The semiconductor laser device according to Claim 13, wherein said semiconductor laser element incorporates a diffraction grating, and oscillates plural longitudinal modes.

18. The semiconductor laser device according to Claim 13, wherein:
said semiconductor laser element includes an active layer; and
said control function is defined such that a temperature of said active layer remains substantially constant for varying driving currents.

19. The semiconductor laser device according to Claim 13, wherein said means for controlling includes a means for storing said control function.

20. The semiconductor laser device according to Claim 13, wherein:
said means for controlling further comprises a means for setting a desired wavelength, and a means for storing plural control functions;

said means for controlling is configured to select a new control function from said plural control functions that corresponds to a desired wavelength entered into said means for setting; and

said means for controlling is configured to control said temperature regulating unit according to said new control function.

21. The semiconductor laser device according to Claim 13, wherein said control function is common to semiconductor laser devices having similar structure and operation.

22. The semiconductor laser device according to Claim 13, wherein said control function is defined by plural temperatures detected by said temperature measuring element and corresponding driving currents detected by said current detecting unit where a substantially constant wavelength output from said semiconductor laser element is maintained.

23. The semiconductor laser device according to Claim 13, wherein said control function is a linear function of predetermined temperature versus predetermined driving current.

24. The semiconductor laser device according to Claim 13, wherein said control function is a quadratic function of predetermined temperature versus predetermined driving current.

25. The semiconductor laser device according to Claim 13, wherein said temperature regulating unit is a Peltier device and said temperature measuring device is a thermistor.

26. A drive control method for a semiconductor laser device, the method comprising the steps of:

determining a control function defined as a relationship between a predetermined driving current and a predetermined temperature to achieve a substantially constant wavelength output from a semiconductor laser element of the semiconductor laser device;

detecting a driving current applied to the semiconductor laser element; and

controlling a temperature regulating unit such that a temperature detected by a temperature measuring element substantially equals the predetermined temperature corresponding to the detected driving current as defined by the control function,

wherein the semiconductor laser element and the temperature measuring element are

thermally connected to the temperature regulating unit.

27. The method according to Claim 26, wherein the step of determining the control function includes the steps of:

detecting plural temperatures using the temperature measuring element and detecting corresponding driving currents where a substantially constant wavelength output from the semiconductor laser element is maintained; and

fitting a curve using the detected plural temperatures and corresponding drive currents.

28. The method according to Claim 26, wherein the step of controlling the temperature regulating unit includes controlling the temperature regulating unit to extract heat from the semiconductor laser element as the detected driving current increases in accordance with the control function.

29. The method according to Claim 26, wherein the semiconductor laser element incorporates a diffraction grating, and oscillates plural longitudinal modes.

30. The method according to Claim 26, further comprising the step of storing the control function within a storage unit.

31. The method according to Claim 26, further comprising the steps of:

storing plural control functions corresponding to different constant wavelengths;

setting a desired constant wavelength;

selecting a new control function from the plural control functions that corresponds to the desired constant wavelength; and

controlling the temperature regulating unit according to the new control function.

32. The method according to Claim 26, wherein the control function is a linear function of predetermined temperature versus predetermined driving current.

33. The method according to Claim 26, wherein the control function is a quadratic function of predetermined temperature versus predetermined driving current.

34. A drive control method for a semiconductor laser device for controlling a temperature of a semiconductor laser element on a basis of a temperature detected by a temperature measuring element disposed near the semiconductor laser element thereby controlling a wavelength of a laser beam oscillated by the semiconductor laser element, the method comprising the steps of:

detecting a driving current applied to the semiconductor laser element;

acquiring a relationship between driving current and temperature at which the wavelength of the laser beam oscillated by the semiconductor laser element is generally constant; and

controlling the temperature of the semiconductor laser element so that the detected temperature of the semiconductor laser element and the corresponding detected driving current satisfy the acquired relationship.

35. The method according to Claim 34, wherein the relationship is a relationship between the driving current and the temperature of the semiconductor laser element at which a temperature of an active layer the semiconductor laser element is generally constant.

36. A drive control method for a semiconductor laser device for controlling a temperature of a semiconductor laser element on a basis of a temperature detected by a temperature measuring element disposed near the semiconductor laser element thereby controlling a wavelength of a laser beam oscillated by the semiconductor laser element, the method comprising the steps of:

detecting a driving current applied to the semiconductor laser element;

acquiring a plurality of relationships between driving current and temperature in

which the wavelength of the laser beam oscillated by the semiconductor laser element is generally constant;

setting a desired wavelength;

changing from a present relationship to a new relationship corresponding to the desired wavelength; and

controlling a temperature of the semiconductor laser element so that the detected temperature and the corresponding detected driving current satisfy the new relationship.